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## Evaluation of tomato (*Solanum lycopersicum* L.) genotypes for growth, yield attributes and yield under subtropical region of Jammu

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### Abstract

The present investigation was carried out during spring-summer season of 2020-21 at the Experimental Research Farm-I of Division of Vegetable Science, Chatha, SKUAST - Jammu, Union territory of Jammu and Kashmir. The experimental materials for the present investigation consisted of eight genotypes (varieties/hybrids) and were evaluated for horticultural traits and data exhibited significant variation in eight genotypes for different horticultural traits. The maximum plant height was recorded in genotype Palam Tomato Hybrid 1 (145.43 cm). The maximum number of primary branches per plant was observed in Arka Rakshak (9.11). Pusa Ruby (35.44 days) was found early flowering variety which can be used in crop improvement programmes. The maximum number of flower clusters (truss) per plant was seen in Arka Rakshak (16.11) and number of flowers per cluster in genotype Arka Samrat (9.00). The highest number of fruits per cluster was recorded in Arka Rakshak (6.33) and genotype Arka Samrat (6.23) was found to be statistically par with this. Genotype Punjab Varkha Bahar 4 had the highest number of fruits per plant (62.22). Arka Samrat showed highest average fruit weight of 77.24 g. The minimum fruit yield per plant was recorded in genotype Pusa Ruby (0.79 kg), while maximum with genotype Arka Samrat (2.23 kg). From the present studies, it can be inferred that the genotypes Arka Samrat and Arka Rakshak performed better for most of the horticultural traits. For vegetable experts, researchers, and producers in subtropical region of Jammu, the results of this study may be significant sources of knowledge on the horticultural traits of the genotypes that were under study.

**Keywords:** Genotype, evaluation, horticultural traits, truss and yield

### Introduction

Tomato (*Lycopersicon esculentum* Mill.), belong to the Solanaceae family, is one of the most commonly cultivated vegetable crops worldwide. In India it is cultivated in 83,000 ha area with a production of 7, 90, 000 tonnes in both hills and plains. In J&K, it is cultivated in 3.29 th ha with a production of 79.95 th tonnes and a productivity of 24.34 tonnes/ha (Anonymous, 2022) <sup>[1]</sup>. It can also be cultivated as sole, inter cropped as well as in vertical cropping system to increase production and productivity per unit area (Panwar *et al.*, 2021) <sup>[10]</sup>. This crop is also more suitable under poly house structure (Singh *et al.*, 2017) <sup>[14]</sup>. The health benefit of tomato makes it a one of the most commercially viable commodity which can be a component of year round vegetable cultivation (Noopur *et al.*, 2021) <sup>[6]</sup> as well as food and nutrition security (Noopur *et al.*, 2023) <sup>[8]</sup>. Mature tomato fruits are served fresh as salad or cooked. A significant amount of tomato is used in the production of value-added consumables like as puree, paste, powder, ketchup, and sauce. Green, immature fruits are utilised to make pickles and chutney while the fully matured entire fruits are canned. Because of its widespread use and high nutritional value, tomato actually tops the list of processed vegetables. It also holds a special place in the world of vegetables because it provides lycopene, ascorbic acid, and beta-carotene (potent antioxidants), as well as flavour and colour, making it a poor man's orange in many cultures (Thamburaj and Singh, 2013) <sup>[16]</sup> and is potential to meet out the challenges of malnutrition (Noopur *et al.*, 2019) <sup>[7]</sup>. The analysis of various yield attributing characters and their inter-relationship can be of immense help in selecting desirable genotypes/varieties for higher yield under agro climatic conditions of J&K.

The potential of the tomato is not completely exploited due to a lack of adequate data on the varieties best suited to the agro-climatic conditions. It is important to evaluate genotypes with a focus on quality yield before recommending for appropriate area. In light of the aforementioned information, it was deemed necessary to study on the genotypes performance

of in subtropical climate of Jammu in order to identify and suggest the cultivars most appropriate for the local agro-climate.

### Material and Methods

A field experiment was conducted during 2020-21 at the Experimental Research Farm-I of Division of Vegetable Science, Chatha, SKUAST - Jammu, J&K. The Experimental farm is located at 32.69° N latitude 74.65° E longitudes and 336 a msl. The climate of farm is subtropical with hot dry summer, hot humid during rainy season and cold winter month. The maximum temperature recorded to be 45° C during summer month (May-June) and minimum temperature was 10 °C during winter. The mean annual rainfall is 1000-12000 mm. The treatment consisted of eight varieties/genotypes viz., Pusa Ruby, Palam Tomato Hybrid 1, Punjab Varkha Bahar 4, Arka Rakshak, Arka Samrat, PKM 1, Roma and Hisar Arun were tested in Randomized Block Design with three replications. Seedlings were transplanted at a spacing of 60 cm × 45 cm. All the cultural practices as per recommendations specified in Package and Practices, SKUAST, Jammu were followed to raise a healthy crop.

The observations were recorded on five randomly selected plants per replication for each genotype on nine traits: i) plant height (cm), ii) number of primary branches, iii) days to 50% flowering iv) number of flower clusters per plant, v) number of flowers per cluster, vi) number of fruits per cluster, vii) number of fruits per plant, viii) average fruit weight (g), ix) fruit yield per plant (kg). Mean across three replications were calculated for each trait and the mean performance is assessed. The recorded data were statistically analyzed at 5% level of significance following the standard process as stated by Panse and Sukhatme (1967) [9].

### Results and Discussion

Analysis of variance revealed highly significant differences among genotypes for all the traits under study. The mean performance of different genotypes for different characters and grand mean for different characters are presented in Table 1.

#### Growth parameters

Plant height ranged from 42.50 cm (Pusa Ruby) to 145.43 cm (Palam Tomato Hybrid 1) with overall mean value of 83.51 cm. whereas genotypes namely PKM 1(86.23 cm), Arka Rakshak (85.87 cm) and Punjab Varkha Bahar 4 (82.47 cm) were found to be statistically at par with an overall mean value of 83.51. The maximum number of primary branches was recorded in Arka Rakshak (9.11) and minimum in Pusa Ruby (4.44) with overall mean value of 6.08. While, genotypes namely, Arka Samrat (7.33), Punjab Tomato Hybrid 1 (6.44), PKM 1 (6.22), Roma (5.22), Punjab Varkha Bahar 4 (5.11) and Hisar Arun (4.78) were statistically at par with an overall mean value. Varietal traits such as height, primary branches per plant and other physical attributes are regulated and expressed by particular genes. These findings are consistent with those of Jatav *et al.* (2017) [3], Swuro *et al.* (2021) [15], Waiba *et al.* (2021) [17] who found a broad variation in plant height and number of primary branches in different tomato varieties.

#### Flower parameters

Data for days to 50% flowering differed significantly among

genotypes and ranged from 35.44 days in Pusa Ruby to 52.56 days in genotype Arka Samrat with overall mean value of 42.39. Punjab Varkha Bahar 4 (41.78 days) and Arka Rakshak (44.44 days) were statistically at par with overall mean value of 42.39 days. The maximum number of flower clusters per plant was seen in Arka Rakshak (16.11) and the minimum were recorded in Hisar Arun (6.11) with overall mean value of 10.55. Genotype Pusa Ruby (13.00) and Arka Samrat (12.33) were found to be statistically at par with Arka Rakshak (16.11). Maximum number of flowers per cluster was recorded in genotype Arka Samrat (9.00) and minimum in Pusa Ruby (3.27) with overall mean value of 5.91. Arka Rakshak (7.60) was statistically at par with Arka Samrat (9.00) while genotypes Roma (7.00), PKM 1 (6.20) and Punjab Varkha Bahar 4 (5.67) had statistical parity with overall mean value (5.91). Similar variation in days to 50% flowering, number of flower clusters per plant and number of flowers per cluster was earlier reported by Rojalin *et al.* (2019) [12] and Mounica *et al.* (2022) [4] in different tomato cultivars.

#### Yield parameters

It is evident from the Table 1 that there was significant difference in yield attributing characters among various genotypes. Number of fruits per cluster varied from 2.60 (Pusa Ruby) to 6.33 (Arka Rakshak) with overall mean value of 4.25. The highest number of fruits per cluster was recorded in Arka Rakshak (6.33) and genotype Arka Samrat (6.23) was found to be statistically par with this. A wide variation was found among the genotypes for the number of fruits per plant, which ranged from 20.10 (Pusa Ruby) to 62.22 (Punjab Varkha Bahar 4), with an overall mean value of 34.96. The genotype Punjab Varkha Bahar 4 had the highest number of fruits per plant (62.22) followed by Arka Samrat (42.53), Arka Rakshak (37.33), Hisar Arun (35.30), Palam Tomato Hybrid 1 (31.90), Roma (27.67) and PKM 1 (22.60). The average fruit weight revealed significant differences amongst the genotypes which ranged from 27.31 g (PVB 4) to 77.24 g (Arka Samrat) with overall mean value of 47.95. The genotype Roma showed average fruit weight of 61.13 g per plant followed by Arka Rakshak (58.79 g), Palam Tomato hybrid 1 (47.50 g), PKM 1 (43.21 g), Hisar Arun (35.20 g) and Pusa Ruby (33.17 g). The fruit yield per plant of tomato evaluated varied significantly among genotypes, ranged from 0.79 kg in Pusa Ruby to 2.23 kg in Arka Samrat with overall mean value 1.41 kg. Arka Rakshak recorded 1.90 kg fruits per plant followed by Punjab Varkha Bahar 4 (1.54 kg), Roma (1.42 kg), Palam Tomato Hybrid 1 (1.34 kg), Hisar Arun (1.25 kg) and PKM 1 (0.81 kg). The genotypes having fruit yield at par with general mean were Punjab Varkha Bahar 4 (1.54 kg), Roma (1.42 kg) Palam Tomato Hybrid 1 (1.34 kg) and Hisar Arun (1.25 kg). The results related to fruit yield attributes of different genotypes varied significantly at different phases of growth (Table 1).

Any breeding program's ultimate objective is to maximise the yield of marketable produce. This is also the main determinant of whether a farmer would choose a variety or hybrid over another. The hybrids Arka Rakshak and Arka Samrat produced greater yields primarily because they had higher number of flower clusters, flowers per cluster, fruits per cluster, fruits per plant and higher average fruit weight. Variation in yield parameters viz., number of fruits per cluster, number of fruits per plant, average fruit weight and fruit yield

per plant was might be due to genetic makeup of the plant. Such kind of genetic differences for marketable fruit yield and other plant characters in different tomato hybrids had also

been reported by Bharathkumar *et al.* (2017)<sup>[2]</sup>, Mounica *et al.* (2022)<sup>[4]</sup> and Shukla *et al.* (2021)<sup>[13]</sup>.

**Table 1:** Mean performance of various horticultural traits in tomato (*Solanum lycopersicum* L.).

Varieties/ Hybrids	Plant Height (cm)	Number of primary branches	Days to 50% Flowering	Number of flower clusters per plant	Number of flowers per cluster	Number of fruits per cluster	Number of fruits per plant	Average fruit weight (g)	Yield per plant (kg)
Pusa Ruby	42.50	4.44	35.44	13.00	3.27	2.60	20.10	33.17	0.79
Palam Tomato Hybrid 1	145.43	6.44	38.78	10.22	4.47	3.60	31.9	47.50	1.34
Punjab Varkha Bahar 4	82.47	5.11	41.78	8.17	5.67	4.13	62.22	27.31	1.54
Arka Rakshak	85.87	9.11	44.44	16.11	7.60	6.33	37.33	58.79	1.90
Arka Samrat	91.40	7.33	52.56	12.33	9.00	6.23	42.53	77.24	2.23
PKM 1	86.23	6.22	38.33	9.45	6.20	3.77	22.60	43.21	0.81
Roma	63.23	5.22	47.78	9.00	7.00	4.00	27.67	61.13	1.42
Hisar Arun	70.97	4.78	40.00	6.11	4.07	3.33	35.3	35.20	1.25
Mean	83.51	6.08	42.39	10.55	5.91	4.25	34.96	47.95	1.41
CD (0.05)	7.347	1.468	2.230	3.814	1.281	1.176	6.708	9.744	0.272
±SE(m)	2.399	0.479	0.728	1.245	0.418	0.384	2.190	3.182	0.089
CV	4.975	13.646	2.975	20.406	12.258	15.684	10.852	11.452	10.895

## Conclusion

From the present investigation it can be concluded that the tomato hybrids Arka Samrat and Arka Rakshak can be cultivated under sub-tropical region of Jammu. The results obtained from the present study revealed that there is a great scope for cultivation under open conditions. Further, these two genotypes can be selected as scion in the graft compatibility studies as they found superior for most of the horticultural traits under study.

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